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Research article

Psychosocial drivers for change: Understanding and promoting stakeholder engagement in local adaptation to climate change in three European Mediterranean case studies

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ABSTRACT

Stakeholder engagement in the processes of planning local adaptation to climate change faces many challenges. The goal of this work was to explore whether or not the intention of engaging could be understood (Study 1) and promoted (Study 2), by using an extension of the theory of planned behaviour. In Study 1, stakeholders from three European Mediterranean case studies were surveyed: Baixo Vouga Lagunar (Portugal), SCOT Provence Méditerranée (France), and the island of Crete (Greece) ($N = 115$). Stakeholders' intention of engaging was significantly predicted by subjective norm (which was predicted by injunctive normative beliefs towards policy-makers and stakeholders) and by perceived behavioural control (which was predicted by knowledge of policy and instruments). Study 2 was conducted in the Baixo Vouga Lagunar case study and consisted of a two-workshop intervention where issues on local and regional adaptation, policies, and engagement were presented and discussed. A within-participants comparison of initial survey results with results following the workshops ($N_{T1} = 12$, $N_{T2} = 15$, $N_{T3} = 12$) indicated that these were successful in increasing stakeholders' intention of engaging. This increase was paired with a) an increase in injunctive normative beliefs towards policy-makers and consequently in subjective norm, and to b) a decrease in perceived complexity of planning local adaptation and an increase in knowledge regarding adaptation to climate change.

1. Introduction

Engagement in decision-making refers to different processes and mechanisms that enable the involvement of stakeholders in the various activities that are related to decision-making, such as communication and public participation (see Rowe and Frewer, 2005). The Intergovernmental Panel on Climate Change (IPCC, 2014) alerts that good decision-making in adaptation to climate change requires the engagement of different stakeholders and the existence of a supportive context, as well as the use of decision-making processes and specific tools to transfer knowledge. Climate change issues can usually be addressed in land-use planning and should be of interest to policy-makers and administration, researchers, end-users, and the general public. Engagement has been promoted as a way to improve the quality of decision-making, to achieve greater acceptance of policies, to enhance understanding of environmental problems, and also in order to ensure the democratic legitimacy of decision-making, considering that all individuals should have the right to be engaged in decisions that affect them (Bautista et al., 2017; Lee et al., 2013). However, the specific nature of climate change issues might undermine stakeholder engagement. The goal of this work is to explore how stakeholders' intention of engaging in adaptation to climate change can be explained (Study 1)

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and increased (Study 2), focusing on a psychosocial perspective.

Over the last decades, there has been a trend towards an increased engagement of stakeholders in decision-making. Legislation in a number of countries has made it necessary to have public engagement. In Portugal, as in most European countries, for example, the Environmental Charter stipulates that public environmental policies are subordinated to the principle of information and participation, which obliges citizens to be involved in environmental policies, giving priority to the dissemination and sharing of data and research, the adoption of policy-monitoring actions, and the nurturing of a culture of transparency and accountability, seeking a high degree of respect for environmental values by the community, while ensuring that citizens have every right to intervene in the design and monitoring of the implementation of environmental policies. It is also defined that the elaboration and revision of the planning instruments imply public engagement from the beginning of this procedure, and, also important, it is specified that climate change is an object of environmental policies. However, guaranteeing the engagement of individuals typically faces many challenges (Rowe and Frewer, 2005). These challenges are amplified when climate change issues are being considered, because they are a rather complex and sometimes controversial, trans-sectorial issue (e.g., water resources, biodiversity, forest, soil, coastal zones, …), which needs to be dealt with within the existing regulation and the regulation on development, risk analysis, and land-use planning. Indeed, the levels of engagement are not typically high (Few et al., 2007), and more research is currently being carried out to learn how engagement can, in fact, be improved (Bautista et al., 2017; Gramberger et al., 2015; Verbrugge et al., 2017). However, currently there are no integrative psychosocial models of how stakeholder's engagement in the process of planning adaptation to climate change can be understood and promoted. Most research focused on the effects of specific psychosocial variables in specific climate change issues. Following on the theory of planned behaviour, we aim to gather various attitudinal, normative and behavioural control variables to have a better and broader understanding of the intention to engage in the process of planning local adaptation to climate change.

1.1. Applying the theory of planned behaviour to understand and promote stakeholder engagement in adaptation to climate change

The theory of planned behaviour (e.g., Fishbein and Ajzen, 2010) is one of the most influential and powerful behavioural theories to understand and predict deliberated behaviours (Nosek et al., 2010), such as engaging in planning adaptation to climate change. It postulates that behaviour is motivated by situation-specific beliefs about its likely outcomes (behavioural beliefs), beliefs about the normative expectations of others (normative beliefs), and beliefs about the presence of factors that may influence the performance of the behaviour (control beliefs). Behavioural beliefs create a favourable or unfavourable evaluation of the behaviour (attitude towards the behaviour), normative beliefs produce the perceived social pressure regarding the behaviour (subjective norm), whereas control beliefs create the perceived ability to perform the behaviour (perceived behavioural control). Behavioural intention, which is the immediate antecedent of behaviour, is formed based on the attitude towards the behaviour, subjective norm, and perception of behavioural control.

There has been little research using this theory to understand and promote stakeholder engagement in local adaptation to climate change. Nonetheless, it has been effectively applied to understand individual intentions and behaviours that reduce the adverse impact of climate change (Kim et al., 2013; Masud et al., 2016) and also to environmental issues at management level (Papagiannakis and Lioukas, 2012). Therefore, in this work, we will explore whether stakeholder engagement in planning local adaptation to climate change can be explained using the theory of planned behaviour (Study 1). As this is a planned, complex, and multidimensional behaviour, the theory should be adequate. Furthermore, since the theory of planned behaviour is one of most influential for its contribution towards framing and evaluating interventions (see Nosek et al., 2010), we also expect it to be useful in promoting stakeholder engagement in local adaptation to climate change (Study 2). To our knowledge, no research has yet tested the usefulness of this theory in promoting the intention of engaging in adaptation to climate change.

2. Study 1

The aim of this study was to explain stakeholders' intention of engaging in the processes of planning local adaptation to climate change by the year 2050. The 2050 time horizon is often used in climate change policies and was explicitly set because the theory of planned behaviour indicates that the behaviour of interest must also be clearly defined in terms of elements pertaining to time. There is still limited evidence showing which beliefs should be integrated into the theory of planned behaviour regarding climate change. Therefore, we opted for exploring the most commonly mentioned issues in existing literature on the subject. In the following text, we will briefly describe these and suggest which role they might have within the aforementioned theory (see Fig. 1).

As determinants of *attitude* towards engaging in planning local adaptation to climate change, we considered beliefs on local adaptation, on adaptation and inaction costs, and on engagement. *Beliefs on local adaptation* were based on the IPCC (2014) definitions of its purpose (e.g., adjustment to expected climate) and should positively predict attitude. *Costs* of adaptation and inaction are expected to have a crucial role in adaptation policies (Watkiss et al., 2007). Perceived costs of adaptation should negatively predict attitude, whereas perceived costs of inaction should positively predict attitude. *Engagement* is also expected to be of great importance (Scherhaufer, 2014), as stakeholders must be engaged in decision-making processes to plan adaptation to climate change. Beliefs towards engagement should positively predict attitude.

To better comprehend the complexity of climate change issues, we extended the theory to include more general beliefs that are often described as relevant antecedents of attitude. More particularly, we added climate change scepticism, uncertainty, spatial and temporal bias, and risk perception. *Climate change scepticism* should negatively predict attitude, to the extent that if individuals are sceptical towards climate change they will not have an attitude that supports planning adaptation. Along this line, Evans et al. (2014) indicated that a higher belief in climate change was related to a higher willingness to mitigate it. Similarly, *local uncertainty* on climate change issues should negatively predict attitude. Vulturius and Gerger Swartling (2015) showed that stakeholders struggle to form a positive opinion when information is perceived as uncertain or contested. Regarding *biases*, researchers have pointed out two that can be of relevance, when it comes to dealing with environmental problems: a *spatial bias*, which leads to considering local environmental conditions as better, and a *temporal bias*, which leads to considering future environmental conditions as worse (Gifford et al., 2009; Schultz et al., 2014). Climate change is often communicated as a global and future issue. As such, individuals might believe in climate change in general, but also think that they will not be affected, because it will occur at a distant point in time and space. Spatial and temporal biases should negatively predict attitude. *Risk perception* is also an important variable when considering climate change (Luís et al., 2018) and was considered in terms of probability, impacts and worriedness towards specific risks expected to increase due to climate change. Risk perception should positively predict attitude.

To understand *subjective norm* towards engaging in planning adaptation to climate change, we considered descriptive and injunctive normative beliefs, having policy-makers and stakeholders in general as referents. Although the original theory of planned behaviour did not consider descriptive normative beliefs, several researchers have

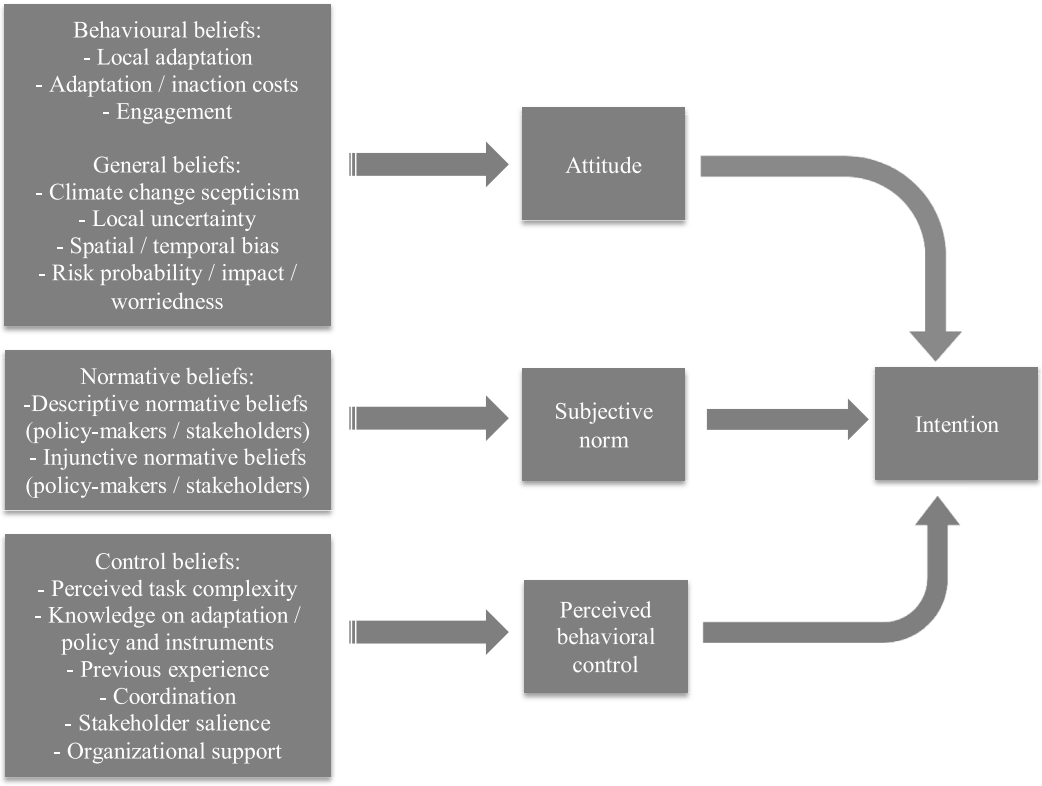

Fig. 1. Model explaining stakeholders' intention of engaging in the process of planning adaptation to climate change, based on an extension of the theory of planned behaviour.

indicated that their inclusion strengthens the predictive power of subjective norm (e.g., Rivis and Sheeran, 2003), and thus they are now frequently included. Normative beliefs should positively predict subjective norm.

Regarding *perceived behavioural control*, we explored the influence of perceived complexity, knowledge, previous experience, coordination among stakeholders, stakeholder salience, and organizational support. The *complexity* of climate change issues might undermine one's perceived ability to plan adaptation, particularly when climate change is downscaled to regional and local scales (Krellenberg and Katrin, 2014). Perceived complexity should negatively predict perceived behavioural control. The *knowledge* needed for planning adaptation to climate change may constitute another barrier (Archie et al., 2014). Indeed, some researchers have been developing climate information systems to facilitate the understanding of how solutions can be appropriately implemented (Mishra et al., 2012). Knowledge about the engagement processes should also be of importance. We expect knowledge to positively predict perceived behavioural control. *Previous experience* in adaptation initiatives might also be a relevant factor, not only because of experience itself but also because there is evidence that participatory initiatives with continuity in time have very positive results (Cloutier et al., 2015; Hart et al., 2015). Previous experience should thus positively predict perceived behavioural control. For adaptation to take place, mechanisms of *coordination* between stakeholders must be implemented (Cloutier et al., 2015; IPCC, 2014) and, therefore, coordination should positively predict perceived behavioural control. Researchers have also pointed out that conflicts among stakeholders can undermine planning adaptation to climate change (Elias, 2012) and, as such, *stakeholder salience* appears to be of importance. It refers to the perceived power, legitimacy, and urgency of issues (Mitchell et al., 1997). Stakeholders respond differently to environmental problems, depending on their salience, and we expect salience to positively predict perceived behavioural control. Finally, most stakeholders represent organizations which might opt for endorsing adaptation to climate change. As Hart et al. (2015) emphasize, efforts to mobilize the necessary interdisciplinary knowledge and expertise into actions to promote sustainability are facilitated by a supportive organizational culture. Therefore, *organizational support* should positively predict perceived behavioural control.

Intention is based on attitude towards behaviour, subjective norm, and perceived behavioural control, and it is considered to be the immediate antecedent of behaviour (Fishbein and Ajzen, 2010). It is expected that attitudes, subjective norms, and perceived behavioural control positively predict intention of engaging in planning local adaptation to climate change (see Fig. 1).

Intention was explored among stakeholders from three case studies located in coastal Mediterranean areas in Europe (see Fig. 2). These case studies were selected because they have been affected by increased urbanisation in the last century, and will be diversely affected by the adverse effects of climate change on water resources, aquatic ecosystems and urban infrastructure. *Baixo Vouga Lagunar* (BVL) corresponds to a small area in the Aveiro region, in Portugal, where the Vouga River reaches the coastal lagoon. Aside from its ecological relevance, this system is of great importance for families, industry, and the tourism economy. However, this region is flood-prone, as floods in the Vouga and Antuã Rivers cover all the landscape, including fields used for agriculture. BVL's landscape encompasses a diversity and specificity of characteristics resulting from the local population's shaping of the ecosystem by creating drainage marshes, farmlands, and opening small channels for water regulation. These watercourses are connected to the Atlantic Ocean through the Ria de Aveiro coastal lagoon, allowing a permanent saltwater, tidal-dependent flow within BVL. Therefore, changes in seawater level and consequently in the lagoon water level might affect BVL through the upstream extension of surface saltwater intrusion. The French case study is the coastal territory of the French land-use planning document *Schéma de Cohérence Territoriale Provence-Méditerranée* (SCOT-PM), which corresponds to the coastal strip from La Ciotat bay to Le Lavandou, located in the Provence-Alpes-Côte d'Azur

Fig. 2. Location of the case studies in Portugal (BVL), France (SCOT-PM), and Greece (Heraklion - Crete).

region. This region is exposed to coastal erosion hazard, coastal flooding and the effects of waves, as well as an increase in mean air temperatures that is expected to continue. In the meantime, the coast is densely urbanized (with large urban areas that include Marseille, and the Toulon and Nice areas) and home to major economic activities and international commerce. Consequently, it is vulnerable to the effects of climate change, which may represent threats to existing and planned infrastructures, urban areas and their development, touristic activities, and health. The north-eastern coastline of the island of Crete, the Heraklion region, is the Greek case study. The coastline consists of beaches and a few rocky coasts, while man-made structures like harbours, marinas and coastal defence structures constitute a large percentage of the coastline. The area hosts the majority of the population and economic/business activity. Over the last decades, it has experienced significant levels of tourism growth, which in turn has led to a sharp differentiation in land use, as well as environmental stress. As the main economic activities of the area are agriculture and tourism, mainly beach-related tourism, climate change poses threats. Climate change effects have substantial consequences on the coastal zone, as sea-level rise and its interaction with storm activity significantly contribute to beach erosion.

These case studies are quite different, but have in common the local need to anticipate and integrate the effects of climate change within decision-making. Therefore, they allow testing if the psychosocial processes framed by the theory of planned behaviour might underlie stakeholder engagement across different contexts.

2.1. Method

The survey was disseminated through stakeholders. Multiple stakeholders were approached: policy-makers, government departments and administration (local, regional, national), non-governmental organizations with environmental, economic and social interests (local, regional, national), local business and industry, local communities, and researchers working in/on climate change issues (regional and national). A mixed strategy approach was used for dissemination, which took place through addressed e-mails, mailing lists, and newsletters, by contacting stakeholders by telephone, in person, and through the parishes (the local communities), and using a snowball sampling technique (i.e., responding stakeholders were asked to recruit or suggest other stakeholders). Respondents provided their informed consent to participate in the research. Most stakeholders responded to the questionnaire online — only 9.56% were inquired face to face.

2.1.1. Participants

The sample of respondents gathered 115 stakeholders, 37.4% of which were from France, 36.5% from Portugal, and 26.1% from Greece. Most stakeholders were male (67.0%), their mean age was 45.72 years old (SD = 14.30), they were integrated in a public-type organization (54.3%; 18.1% were from NGOs, 16% were from private organizations, and 11.7% were from mixed type organizations), they had high-level education (75.8%), and they had studied natural sciences (55.9%). Respondent's anonymity was ensured. To characterize the sample, stakeholders were asked how they identified with different interests and roles. Seventy percent of the stakeholders strongly identified themselves with environmental interests, 44% with social interests, 38% with research interests, 20.9% with political interests, and 17.5% with economic interests. Furthermore, 50% of the stakeholders strongly identified themselves as local stakeholders, 33.7% as regional stakeholders, and 27.5% as national stakeholders.

2.1.2. Measures

The questionnaire gathered items on attitude, subjective norm, and perceived behavioural control (as well as the beliefs these measures are expected to derive from), and intention towards engaging in planning local adaptation to climate change by the year 2050. The timeline was narrowed to 2050, because intention should be as clearly defined as possible (Fishbein and Ajzen, 2010). Measures are typically statements on a 7-point scale ranging from 1 (e.g., strongly disagree/minimal/extremely worthless) to 7 (e.g., strongly agree/maximal/extremely valuable). Measures using different types of response scales are indicated.

Some variables had to be measured by single items to control for questionnaire length. To minimize this limitation, we selected variables of the theory of planned behaviour (e.g., subjective norm), as these have been tested extensively in other subjects, and variables that were relatively more factual or unidimensional (e.g., previous experience).

2.1.2.1. Attitude towards engaging in planning local adaptation to climate change. The degree to which engaging is positively or negatively valued, based on instrumental and experiential evaluations. The measure is based on Fishbein and Ajzen (2010). It is composed of two

items, such as "Being involved in planning adaptation to climate change in [case study] will be… extremely worthless/valuable" (Spearman-Brown = .79).

Local adaptation beliefs. Beliefs towards planning adaptation to climate change are based on IPCC (2014) definitions of local adaptation. The measure is composed of two items (e.g., "Planning adaptation to climate change by the year 2050 in [case study] will enable adjustment to actual or expected climate and its effects (e.g., extreme weather events, sea level rise)") (Spearman-Brown = .68).

Adaptation costs. Beliefs on the current costs of local adaptation to climate change by the year 2050, with items regarding coastal zones, water resources, ecosystem services, health, well-being, tourism, agriculture, and aquaculture. These items were averaged into a composite measure (α = .90).

Inaction costs. Beliefs on the costs of not having locally adapted to climate change by the year 2050, with the same items as the *adaptation costs* measure (α = .90).

Engagement beliefs. Attitudinal beliefs towards engagement in general and towards the inclusion of policy-makers and other stakeholders in processes of local adaptation to climate change. This measure is adapted from (Santos and Lima, 2014). It includes five items (e.g., "Public involvement in decision-making is a vital value these days") (α = .82).

Climate change scepticism. Beliefs on climate change occurrence and its nature. It consists of four items adapted from Evans et al. (2014), such as "I do not believe climate change is a real problem" (α = .70).

Local uncertainty. Beliefs on uncertainties towards methodology, adaptation measures, and expert disagreement were considered. The measure followed on Miles and Frewer (2003). It is composed of three items (e.g., "Whilst scientists believe in planning adaptation to climate change in [case study], they are uncertain as to which measures ensure adaptation") that were averaged into a composite measure (α = .67).

Spatial bias. Assessments of the local and national state of the environment, regarding the environment in general, water resources, biodiversity, fish resources, soil, coastal zones, landscapes, and sanitary conditions. This measure was adapted from Gifford et al. (2009). A composite measure was computed, based on comparative scores aggregating the differences between the eight issues analysed locally and nationally (α = .81). Values above zero indicate that local conditions were viewed as superior to national conditions; those below zero indicate that national conditions were viewed as better.

Temporal bias. Assessments of the current and future state of the local environment by the year 2050, regarding the same items as the *spatial bias* measure, on a 7-point scale ranging from −3 (much worse) to 3 (much better). This measure was also adapted from Gifford et al. (2009). A composite measure was computed (α = .97), wherein scores below zero indicate pessimism (worse than now) and those above zero signify optimism (better than now).

Risk probability. Evaluation of the probability of climate change-related hazards (erosion, flood, saltwater intrusion, drought, forest fire, heat wave, storm, ecosystem degradation, public health threat) in 2050, assuming that no measures of adaptation to climate change are implemented. Response options corresponded to 10 probability labels used by the IPCC (< 1%, < 5%, < 10%, < 33%, 33–66%, > 50%, > 66%, > 90%, > 95%, > 99%), which were grouped into 3 classes with a similar range (< 33%, 33–66%, > 66%) and averaged into a composite measure (α = .90).

Risk impact. Evaluation of the impacts of climate change-related hazards on people, goods, and on the environment by the year 2050, assuming that no measures of adaptation to climate change are implemented (α = .88).

Risk worriedness. Affective evaluations towards climate change-related hazards by the year 2050, assuming that no measures of adaptation to climate change are implemented (α = .84). This measure is adapted from Miceli et al. (2008).

2.1.2.2. Subjective norm towards engaging in planning local adaptation to climate change. The perceived social pressure to engage in planning adaptation to climate change. The measure is based on Fishbein and Ajzen (2010) and it was measured by the item "People expect me to engage in planning adaptation to climate change in [case study] by the year 2050".

Descriptive normative belief towards policy-makers/stakeholders. All measures of normative beliefs follow the distinction between descriptive and injunctive norms and are adapted from Luís and Palma-Oliveira (2016). Perception of whether or not policy-makers/stakeholders are engaged in adaptation to climate change. Beliefs were measured by the items "Most policy-makers/stakeholders are planning adaptation to climate change in [case study] by the year 2050". When responding to the *stakeholder* measure, individuals were asked to exclude policy-makers from the group of stakeholders.

Injunctive normative belief towards policy-makers/stakeholders. Perception of whether or not policy-makers/stakeholders value adaptation to climate change. Beliefs were measured by the items "Most policy-makers/stakeholders believe that I should be planning adaptation to climate change in [case study] by the year 2050".

2.1.2.3. Perceived behavioural control towards engaging in planning local adaptation to climate change. Individuals' perception of their ability to engage in planning local adaptation to climate change. The measure is based on Fishbein and Ajzen (2010) and it was measured by the item "I am confident that I can contribute to planning adaptation to climate change by the year 2050 in [case study]".

Perceived task complexity. Composed of the item "Planning adaptation to climate change in [case study] is… very easy/difficult".

Knowledge on adaptation/policy and instruments. Measured by the items "We would like you to rate your knowledge about planning adaptation to climate change in [case study]/about the strategy and policy instruments that allow planning adaptation to climate change in [case study]. Please use a scale of 0 – 100, where 0 means knowing nothing and 100 means knowing everything you could possibly know about this topic. Using this scale, how much do you currently know about adaptation to climate change in [case study]/about the strategy and policy instruments in [case study] that allow planning adaptation to climate change?" This measure was adapted from Kahlor et al. (2003).

Previous experience. Measured by the item "I often participate in partnerships with other stakeholders to plan adaptation to climate change in [case study]".

Coordination among stakeholders. Measured by the item "Current coordination and communication between different entities (e.g., administration, stakeholders, researchers, local individuals) are adequate to promote adaptation to climate change in [case study]".

Stakeholder salience. Salience is based on stakeholders' power, legitimacy, and urgency towards planning local adaptation to climate change. Power is manifested in one's ability to get someone else to do something he or she would not otherwise have done. Legitimacy is a perception or assumption that the actions are desirable, proper or appropriate. Urgency is defined as the degree to which a stakeholder's claim calls for immediate action (Mitchell et al., 1997). The measure is composed of three items (e.g., "Regarding planning adaptation to climate change in [case study], I have great power over the other stakeholders") (α = .62).

Organizational support. This encompassed two items, such as "My organization is favourable to being involved in planning adaptation to climate change in [case study]" (Spearman-Brown coefficient = .94).

2.1.2.4. Intention of engaging in planning local adaptation to climate change. This is an indication of a person's readiness to engage in a given behaviour (Fishbein and Ajzen, 2010). It grouped two general items, such as "I prepare to plan adaptation to climate change in [case study]", with an item regarding the intention to participate in the study

Table 1
Descriptive Statistics and Multiple Regression Analysis Predicting Attitude towards Engaging in Planning Local Adaptation to Climate Change (N = 90).

Beliefs	*M (SD)*	*B*	*SE B*	β
Local adaptation beliefs	5.48 (1.13)	1.06	0.98	.30**
Adaptation costs	4.81 (1.12)	0.02	0.08	.02
Inaction costs	5.98 (0.97)	0.19	0.10	.18+
Engagement beliefs	6.19 (0.81)	0.45	0.12	.37***
Climate change scepticism	2.62 (1.18)	0.00	0.08	.00
Local uncertainty	4.58 (1.22)	- 0.14	0.07	- .17*
Spatial bias	- 0.06[a] (0.96)	0.18	0.09	.17[+]
Temporal bias	- 0.49[b] (1.58)	0.06	0.06	.10
Risk probability	2.24 (0.54)	- 0.09	0.20	-.05
Risk impact	5.17 (1.02)	0.09	0.12	.09
Risk worriedness	5.48 (1.13)	−0.02	0.11	-.16
$R^2_{adjusted}$ = .40; $F(11, 79) = 6.51$, $p < .001$				

Notes. Scales ranged from 1 to 7, except the risk probability scale that ranged 1 (< 33%), 2 (33–66%), and 3 (> 66%), and the temporal and spatial bias scales that reflect composite scores. [a] Not significantly different from zero, suggesting no bias; [b] significantly different from zero, suggesting future pessimism.*** $p < .001$, ** $p < .010$, * $p < .050$, [+] $p < .078$.

workshops, which was measured on a 5-point scale ranging from 1 (definitely not) to 5 (definitely yes). Items were standardized, to account for the different response scales, and averaged into a composite measure (α = .79).

2.2. Results and discussion

Differences between case studies were controlled creating dummy variables. To reduce multicollinearity, k – 1 variables were created. SCOT-PM has the highest *n* and hence was the default category.

2.2.1. Predicting attitude

Attitude was high, illustrating that stakeholders positively valued engaging in planning local adaptation to climate change (M = 6.00, SD = 0.99). Hierarchical multiple regression analysis indicated that the psychosocial predictors explained 40% of the variance of attitude. Addition of the case study dummy variables did not significantly improve prediction (R^2 change = .00. F = 0.23, p = .792) and they were dropped to preserve a higher degree of freedom. Only 5 among the 11 expected predictors were significant (Table 1). Engagement beliefs were the strongest predictor, and these positively predicted attitude with a medium size effect. Stakeholders who highly valued public engagement processes also highly valued planning adaptation to climate change in the case studies. In addition, local adaptation beliefs positively predicted attitude with a medium size effect, showing that individuals who agreed with the IPCC (2014) definitions of local adaptation valued planning adaptation to climate change, but to a lower extent than engagement beliefs. This indicates that stakeholder engagement in adaptation to climate change might be relatively more determined by beliefs about engagement than by beliefs about climate change.

Local uncertainty towards methodology, adaptation measures, and related to expert disagreement negatively predicted attitude. This result supports the expectation that, if local adaptation issues are perceived as uncertain, individuals will form a more negative attitude towards planning local adaptation to climate change.

Attitude was marginally positively predicted by the perceived costs of inaction, but not by the perceived costs of adaptation. Therefore, to promote a positive evaluation of engaging in planning adaptation to climate change, it might be more effective to focus on the future high costs of a policy of inaction, i.e., on the future high costs of not having adapted.

Attitude was also marginally positively predicted by the spatial bias scale. One sample *t*-test evidenced that spatial bias did not emerge, as local conditions were not perceived as better but as similar to national conditions, $p > .050$. The non-existence of a spatial bias positively predicted attitude towards planning local adaptation to climate change, which is congruent with our expectation that spatial bias should relate negatively to local adaptation to climate change. This result supports that it might be necessary to counter spatial bias in order to promote attitude towards planning adaptation to climate change. On the other hand, temporal bias (Gifford et al., 2009) did emerge, illustrating that future local conditions were perceived as worse than current conditions, $t(111) = - 3.29$, $p = .001$, but it did not predict attitude. Therefore, believing in worse future conditions did not determine stakeholder evaluation of planning adaptation to climate change.

Attitude was not significantly predicted by other variables that are often considered relevant, such as climate change scepticism and risk perception. Regarding scepticism, it might be that the stakeholders who accepted to discuss local adaptation issues were not that sceptical, to begin with, and, therefore, the variance of the sample would not be sufficient to capture possible effects. Indeed, the mean level of scepticism in our sample was low. However, to explore this explanation, we would need to know the results of the stakeholders that did not accept the invitation to respond to the survey.

As for the risk perception measure, even if hazards were globally perceived as moderately to highly probable and likely to cause impacts and worriedness, it did not predict attitude. A possible explanation for the lack of importance of risk perception might be related to the type of language typically used in vulnerability assessments in climate change contexts, which is more framed in terms of adaptation than risk reduction (Romieu et al., 2010). We further disaggregated the hazards to explore if there were simple significant correlations between attitude and each hazard in particular. Only one result emerged among the nine hazards in the three risk dimensions: risk worriedness towards ecosystem degradation was positively related to attitude (r = .35, $p < .001$). This result is in line with Miceli et al. (2008) regarding the risk perception dimension, as worriedness towards hazards appears to be crucial.

2.2.2. Predicting subjective norm

Subjective norm was low (M = 3.84, SD = 1.97), suggesting stakeholders did not perceive much social pressure to engage in planning local adaptation to climate change. Hierarchical multiple regression analysis evidenced that 44% of the variance of subjective norm was explained by psychosocial predictors. Addition of the case study dummy variables significantly improved prediction, suggesting that differences between Crete and the other case studies are responsible for around 11% of the variance of subjective norm (R^2 change = .11; F = 10.58, $p < .001$). Mean differences test confirm that Crete had a significantly lower subjective norm (M = 2.54, SD = 1.69; $F(2,92) = 9.77$, $p < .001$) than the other case studies. Subjective norm was only predicted by injunctive normative beliefs, for which emerged positive significant relations with a significant strong effect size (towards policy-makers) and with a marginally significant low effect size (towards stakeholders) (Table 2). This is an interesting result because descriptive-type beliefs are usually more influential than injunctive ones. Researchers have suggested that injunctive beliefs are more likely to influence intention when descriptive beliefs are low (Cialdini, 2003). Indeed, descriptive belief towards policy-makers had a medium/low mean result, suggesting that stakeholders perceived that it was rather infrequent for policy-makers to plan adaptation. Injunctive belief was not very high, but a one-sample *t*-test indicated that it was statistically higher than descriptive belief (M = 0.34, SD = 1.58, $t(93) = 2.07$, p = .041). Regarding the referents of normative beliefs, results indicate that policy-makers are perceived as more relevant than other types of stakeholders. This result is not surprising, because policy-makers usually have more salience in decision-making processes. It suggests that it might be necessary to communicate about the role that the other stakeholders can and need to play in planning local adaptation to climate change to avoid “top-down”, non-participative decision-making

Table 2
Descriptive Statistics and Multiple Regression Analysis Predicting Subjective Norm towards Engaging in Planning Local Adaptation to Climate Change ($N = 92$).

Beliefs	*M (SD)*	*B*	*SE B*	β
DNB towards policy-makers	3.44 (1.52)	0.11	0.12	.08
DNB towards stakeholders (excluding PM)	3.41 (1.54)	- 0.12	0.12	- .10
INB towards policy-makers	3.77 (1.83)	0.55	0.12	.51***
INB towards stakeholders (excluding PM)	3.82 (1.68)	0.23	0.13	.20^{+}
Baixo Vouga Lagunar (dummy variable)	–	- 0.20	0.35	- .05
Island of Crete (dummy variable)	–	- 1.60	0.38	- .36***
$R^2_{adjusted}$ = .54; $F(6, 86) = 18.87$, $p < .001$				

Notes. Scales ranged from 1 to 7. DNB = descriptive normative beliefs. INB = injunctive normative beliefs. PM = policy-makers. *** $p < .001$; $^{+}$ $p = .071$.

processes.

2.2.3. Predicting perceived behavioural control

Perceived behavioural control was medium/high ($M = 5.06$, $SD = 1.41$), which indicates that stakeholders have positive perceptions of their ability to engage in planning local adaptation to climate change. The results of hierarchical multiple regression analysis indicated that psychosocial predictors explained 22% of the variance of perceived behavioural control (Table 3). Addition of the case study dummy variables significantly improved prediction, suggesting that differences between BVL and the other case studies are responsible for around 6% of the variance of perceived behavioural control (R^2 change = .06, $F = 3.27$, $p = .043$). Mean differences test confirmed that BVL had a significantly higher perceived behavioural control ($M = 5.68$, $SD = 1.21$; $F(2,91) = 8.54$, $p < .001$). This variance is considerably lower than the one that was explained for the other determinants of intention, suggesting that other psychosocial predictors that we did not anticipate might also determine perceived behavioural control. Only knowledge on policy and instruments emerged as a significant predictor, with a positive medium weight. Knowledge on adaptation to climate change was not a significant predictor. This result, combined with the relatively higher weight of engagement beliefs in comparison to adaptation beliefs in determining attitude (Table 1), suggests that, when it comes to planning local adaptation to climate change, transversal issues such as engagement, policies, and instruments might be more relevant than specific climate change issues.

Perceived behavioural control was not predicted by stakeholder perceived task complexity and their previous experience, although planning local adaptation to climate change was perceived as highly complex and stakeholders mentioned little experience. Perceived behavioural control was also not predicted by more inter-individual variables, such as stakeholder salience, coordination among stakeholders, which was low, or organizational support, which was high.

Table 3
Descriptive Statistics and Multiple Regression Analysis Predicting Perceived Behavioural Control towards Engaging in Planning Local Adaptation to Climate Change ($N = 84$).

Beliefs	*M (SD)*	*B*	*SE B*	β
Perceived task complexity	5.23 (1.41)	- 0.00	0.11	-.00
Knowledge on adaptation	46.11 (25.65)	0.00	0.01	.06
Knowledge on policy/instruments	44.10 (27.87)	0.01	0.01	.28*
Previous experience	3.18 (1.94)	−0.00	0.09	-.00
Coordination among stakeholders	2.87 (1.79)	−0.10	0.09	-.12
Stakeholder salience	3.82 (1.40)	0.10	0.13	.09
Organizational support	5.57 (1.43)	0.20	0.12	.20
Baixo Vouga Lagunar (dummy variable)	–	0.95	0.38	.33*
Island of Crete (dummy variable)	–	0.47	0.39	.14
$R^2_{adjusted}$ = .27; $F(9, 75) = 4.38$, $p < .001$				

Notes. Scales ranged from 1 to 7, except the knowledge scales, which ranged from 0 to 100. * $p < .050$.

Table 4
Descriptive Statistics and Multiple Regression Analysis Predicting Intention of Engaging in Planning Local Adaptation to Climate Change.

Beliefs	*M (SD)*	*B*	*SE B*	β
Attitude	6.00 (0.99)	0.12	0.08	.14
Subjective norm	3.84 (1.97)	0.15	0.04	.36***
Perceived behavioural control	5.06 (1.41)	0.19	0.05	.33***
$R^2_{adjusted}$ = .33; $F(3, 88) = 15.88$, $p < .001$				

Notes. Scales ranged from 1 to 7. ** * $p < .001$.

2.2.4. Predicting intention

Stakeholders' intention was medium, $M = 0.01$, $SD = 0.84$. Intention items were normalized to account for the different response scales of the items. To facilitate understanding, we further present the raw results for the general items, which were medium, $M = 4.73$, $SD = 1.58$, on scales ranging from 1 to 7, and for the specific intention to participate in workshops, which was relatively high, $M = 3.99$, $SD = 1.06$, on a scale ranging from 1 to 5. Multiple regression analysis evidenced that 33% of the variance of intention was explained by psychosocial predictors. Addition of the case study dummy variables did not significantly improve prediction (R^2 change = .00. $F = 0.48$, $p = .623$) and they were dropped to preserve a higher degree of freedom. Subjective norm and perceived behavioural control were significant positive predictors, with medium-size effects, but the attitude was not (Table 4). As such, stakeholders' intention was explained by perceived social pressure to engage in planning adaptation and perceived ability in doing so, but not by personal evaluations.

3. Study 2

The aim of Study 2 was to test whether or not an intervention could be successful in changing beliefs and, consequently, in increasing stakeholders' intention of engaging in the processes of planning local adaptation to climate change.

When selecting the targets for the intervention, it was considered whether there was room for change or not, and the relative weights of the variables in the prediction of intention and its antecedents, as indicated by Fishbein and Ajzen (2010), were also taken into account. In general, the greater the relative weight of a given variable, the more likely it is that changing that variable will influence intention. However, coefficients are affected by factors that may have little to do with the relative importance of the different predictors, such as low variability or small sample size (Fishbein and Ajzen, 2010). Therefore, our primary criterion was if there was room for change. The intervention took place in the BVL case study and was directed at normative beliefs (descriptive and injunctive, towards policy-makers and stakeholders) and control beliefs (knowledge on adaptation to climate change and on policy and instruments, perceived complexity, and stakeholder salience).

The intervention occurred during two local workshops on adaptation to climate change. These broadly consisted of presenting and discussing a) climate change in BVL and that region, b) policies of adaptation to climate change, c) stakeholder engagement in adaptation to climate change. The first workshop's goal was to gather stakeholder ideas for local adaptation measures, whereas the second workshop's goal was to discuss opportunities and constraints for the implementation of the most promising measures. The intervention was evaluated by comparing Study 1 questionnaire results for BVL, which served as the baseline for the intervention (Time 1), with questionnaire results following the first workshop (Time 2) and the second workshop (Time 3).

We expected to find an increase in normative and control beliefs between Time 1 and Time 3 — except for perceived task complexity,

which was expected to decrease. Changes in normative and control beliefs should further produce changes in subjective norm and perceived behavioural control, respectively, and, as a consequence, in intention (Fishbein and Ajzen, 2010). Therefore, we also expected these variables to increase between Time 1 and Time 3. Regarding the timing of changes, it appears that changes are more noticeable when initiatives are continued in time (Cloutier et al., 2015; Hart et al., 2015). Also, the second workshop should lead stakeholders to think about local adaptation more concretely, as it focused on discussing opportunities and constraints for the implementation of adaptation measures. As such, we anticipated finding more changes between Time 2 and Time 3 than between Time 1 and Time 2.

3.1. Method

3.1.1. Participants

Some stakeholders chose not to disclose their identity. For this reason, data that could not be paired between at least two waves was not analysed. The responses of 12 stakeholders in Time 1, 15 in Time 2, and 12 in Time 3 were taken into account. Most stakeholders were male (64.7%), their mean age was 49.73 years old (SD = 12.49), they were integrated in a public-type organization (70.6%; 11.8% were from NGOs, 11.8% were from private organizations, and 5.9% were from mixed type organizations), they had higher education (70.6%), and they had studies in the natural sciences area (46.7%). Fifty percent of the stakeholders strongly identified themselves with political interests, 43.4% with environmental interests, 29.6% with research interests, 28.5% with economic interests, and 25.5% with social interests. Forty one percent of the stakeholders strongly identified themselves as regional stakeholders, 34.9% as national stakeholders, and 25.2% as local stakeholders.

3.1.2. Measures

A reduced version of the questionnaire presented in Study 1 was applied at Times 2 and 3. The reduced version included only the variables the intervention was targeting: subjective norm, normative beliefs, perceived behavioural control, stakeholder salience, perceived task complexity, knowledge on adaptation and on policy and instruments, and intention of engaging in the process of planning local adaptation to climate change. Intention was the only measure that was adapted. The item regarding the intention to participate in the workshops did not make sense in Time 3 and had to be excluded, in order to have comparative results for the three times (Spearman-Brown = .82).

3.1.3. Procedure

At Times 2 and 3, stakeholders responded to the questionnaire at the end of the workshops. Each workshop lasted approximately three working hours (a total of five hours including lunch and a coffee break) and comprised plenary sessions and discussion roundtables based on the “World Café” methodology (The World Café Community Foundation, 2015).

The goal of the first workshop (Time 2) was to discuss the impacts of local climate change, adaptation policies, and stakeholder engagement, in order to derive possible local adaptation measures within these three domains. Information was provided and discussed, regarding: a) two past local projects of the team, and the participation of stakeholders in both of these, to increase *descriptive normative beliefs*; b) the results of the survey from Study 1, namely those which indicated attitudes and intentions of endorsing planning local adaptation to climate change, to increase *injunctive normative beliefs*; c) local and regional climate change and the urgency of adaptation, to increase *knowledge on adaptation* and *stakeholder salience* (*legitimacy* and *urgency*) and to decrease *perceived task complexity*; d) the strategy and policy instruments that allow planning adaptation to climate change, to increase *knowledge on policy and instruments* and *stakeholder salience* (*power*) and to decrease *perceived task complexity*.

The goal of the second workshop (Time 3) was to summarize the adaptation measures that had been proposed by stakeholders in the first workshop (after the project team had selected and elaborated on those that fitted in with the mainstream principles of adaptation), and to discuss which were the opportunities and constraints for their actual implementation. In addition to information c) and d), which had already been presented in the first workshop, new information was also provided and discussed, namely: a) 10 local and regional adaptation dissemination initiatives between 2014 and 2015, to increase *descriptive normative beliefs*, as well as *injunctive normative beliefs*, by suggesting that this was a sign that these problems are socially valued and that stakeholder engagement in planning adaptation is valued; b) the boundaries of scientific knowledge, and the need for stakeholder engagement in planning local adaptation to climate change, to promote *stakeholder salience*.

3.2. Results and discussion

The size of the samples was small and we could not test if data was normally distributed. Therefore, we used non-parametric statistics that were adequate to the number of samples (k = 3) and to the number of respondents (N = 40) (Siegel and Castellan, 1988).

3.2.1. Changes in time

We ran *Friedman's* Two-Way Analysis of Variance by Ranks to test if there were changes in stakeholder normative and control beliefs and, consequently, in subjective norm and perceived behavioural control, and in the intention of engaging in the processes of planning local adaptation to climate change between Time 1, 2, and 3. Results for the variables that changed are presented in Table 5. Descriptively, these variables tend to change in time as expected (with the exception of knowledge, which slightly decreased in Time 3), although these changes did not occur in time as expected.

Between the initial survey and the second workshop, there was an increase in injunctive normative beliefs towards policy-makers, but not towards stakeholders. Perceptions of whether or not policy-makers value the fact that adaptation to climate change in BVL is being planned changed from medium to relatively high. Descriptive normative beliefs did not change over time. Even if stakeholders believed policy-makers valued planning local adaptation to climate change more, they did not change their perceptions regarding how others were actually engaging in planning local adaptation to climate change. There was also an increase in subjective norm, likely resulting from the change in injunctive normative beliefs towards policy-makers. Stakeholder-perceived social pressure to engage in planning adaptation to climate change increased from medium to relatively high.

Regarding control beliefs, perceived task complexity decreased from

Table 5
Descriptive Statistics (Median) and Friedman's Two-Way Analysis of Variance by Ranks for the Variables that changed in Time, for the BVL case-study (N_{T1} = 12, N_{T2} = 15, N_{T3} = 12).

Variable	Time			X^2
	1	$2_{(WS1)}$	$3_{(WS2)}$	
INB towards policy-makers	4_a	4_a	6_a	6.615*
Subjective norm	4_a	5_b	6_{ab}	7.600*
Perceived task complexity	5_{a+}	4_{ab}	3_{b+}	9.333**
Knowledge on adaptation	45.00_a	60.00_a	57.50_a	6.857*
Intention	4.75_{a+}	5.50_{ab}	6.50_{b+}	7.895*

Notes. Scales ranged from 1 to 7, except the knowledge scale, which ranged from 0 to 100. INB = injunctive normative belief. WS = workshop. Medians with differing subscripts within rows are significantly different, based on the Wilcoxon signed rank test pairwised comparisons with Bonferroni correction applied, resulting in a significance level set at $p < .017$. ** $p < .010$,* $p < .050$, $^+$ $p < .020$.

relatively high to medium/low, and knowledge on adaptation increased. As such, discussing local and regional climate change, strategy, and policy instruments, and engagement in planning adaptation to climate change might make it easier and increase knowledge on climate change. However, stakeholder salience and knowledge on policy and instruments did not change. It might be challenging to increase stakeholder salience, as power, legitimacy, and urgency towards planning local adaptation to climate change might be largely determined in other types of interactions between stakeholders. Knowledge on policy and instruments might not have increased because these are typically very complex areas (see Rodrigues et al., 2016). There was no change in perceived behavioural control. This may have happened due to a lack of correlation between this variable and perceived task complexity and knowledge on climate change, as was found in Study 1. To explore this possibility, we additionally ran simple correlational analyses using only Time 3 data. Results illustrate a strong significant correlation between perceived task complexity and perceived behavioural control, $r = -.57$, $p = .051$, but no correlation with knowledge on climate change, $p > .050$. This suggests that, following the intervention, the decrease in perceived task complexity was not sufficient to produce a change in perceived behavioural control, and that knowledge on climate change was not related to perceived behavioural control.

Stakeholders' intention of planning adaptation to climate change increased from medium/high in Time 1 to very high in Time 3. Changes in injunctive normative beliefs and subjective norm appear to have been enough to increase intention.

3.2.2. Timing of changes

We anticipated finding more changes between Time 2 and Time 3 than between Time 1 and Time 2. However, pairwise comparisons (see means with differing subscripts within rows in Table 5) illustrate that, when considering these timings, the only significant changes occurred between Time 1 and Time 2 (subjective norm and perceived task complexity). As such, it might have been that the first workshop, where stakeholders were gathered and had the opportunity to know other stakeholders that took interest in adaptation to climate change, was more effective in producing significant changes than asking stakeholders who were together in a second meeting to specifically think about opportunities and constraints for the implementation of local adaptation measures.

4. Summary and concluding discussion

The goal of this work was to understand and promote stakeholder engagement in planning local adaptation to climate change from a psychosocial perspective. To reach it, we used an extension of the theory of planned behaviour that comprehended most of the many challenges of engaging stakeholders in planning adaptation to climate change (e.g., scepticism, uncertainty, adaptation costs, knowledge). Results illustrate that the intention to engage in the process of planning adaptation to climate change was indeed significantly explained in three case studies, and it was promoted in the case study where the intervention took place. This is of relevance because it suggests that this model can be used to increase stakeholder engagement, thereby contributing to improving the decision-making process of adaptation to climate change.

Study 1 illustrated that stakeholder intention to engage in the process of planning local adaptation to climate change was significantly predicted by psychosocial variables. This result emerged despite the differences among case studies, therefore suggesting that the theory of planned behaviour captures the psychosocial processes underlying stakeholder engagement across different contexts. Intention was predicted by subjective norm (which in turn was predicted by injunctive normative beliefs towards policy-makers and stakeholders) and by perceived behavioural control (which in turn was predicted by knowledge on policy and instruments). However, the amount of variability of perceived behavioural control that was explained by predictors was relatively low, which indicates that future studies could benefit from conducting formative research to identify other determinants of perceived behavioural control.

Interestingly, data from these case studies illustrate that variables related to the processes of engagement itself (e.g., attitudes towards engagement and knowledge on policy) might be more relevant than variables related to climate change that are often assumed to be crucial (e.g., scepticism, temporal bias, knowledge on adaptation to climate change, perceived complexity of planning adaptation). This suggests that, at this point, low levels of engagement in local adaptation to climate change might be more related to the issues of engagement in decision-making processes than to the issues of climate change. Stakeholder engagement can easily become a very complex, bureaucratic, relatively unworthy and time-consuming process (Lee et al., 2015). However, it can evolve to become a much simpler and inclusive process.

Study 2 indicated that a two-workshop intervention was successful in changing relevant stakeholder beliefs and in increasing their intention to engage in the processes of planning local adaptation to climate change.

Promoting stakeholder engagement is fundamental for local adaptation to climate change. Stakeholder engagement might not only facilitate a better understanding of climate change and assure democratic legitimacy within this controversial issue, but it can also improve the quality of decision-making. Indeed, research has shown that technical and scientific knowledge is not the only valid form of knowledge to be considered in policymaking. Although it has often been assumed that the development of science would, by itself, lead to better decision-making, a number of studies have demonstrated that scientific and technical knowledge is not sufficient (see Lima, 2004). This is particularly relevant when scientific knowledge is relatively new and involves a considerable degree of uncertainty, such as knowledge on climate change and adaptation. Stakeholder engagement creates an opportunity to include different types of knowledge, parameters, interests, approaches, and experiences in decision-making, making it more likely that decisions will anticipate and account for unintended effects and create better opportunities. “Top-down implemented practices, designed behind a desk with little knowledge of concerns and existing solutions to problems of people in the field, may provide technically effective measures on paper, which in practice prove to be unfeasible within the local context” (de Vente et al., 2017, p. 1).

4.1. Limitations

Three main limitations of this work should be acknowledged. Firstly, the universe of stakeholders targeted for each case study had a low number and practical constraints, such as availability, impeded a random selection of stakeholder samples. This led to relatively small sample sizes, biased towards middle-age males that were integrated in public-type organizations, had high-level education and studied natural sciences. Small size samples are associated with less statistical power, making it more difficult for smaller size effects to reach significance (i.e., increased possibility of type II errors). As such, the results might be less conclusive regarding weaker predictors and variables that had smaller changes in time. Secondly, the studies lacked control. Study 1 was correlational and, therefore, we cannot establish causation. Study 2 did not include a control group that responded to the three surveys but did not attend the workshops, because the number of stakeholders engaged was limited. Nonetheless, we believe this limitation is minimized by the substantial body of research that exists on the theory of planned behaviour and allows inferring causation between variables and in the intervention. Thirdly, as some stakeholders chose not to disclose their identity, part of the data could not be matched. Despite these limitations, this work indicated relevant results, illustrating that it is possible to predict and promote stakeholders' intention of engaging in

local adaptation to climate change.

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